FAA-C-2535
June 15, 1972

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

AUTOMATIC WINDOW WASHING SYSTEMS FOR AIR TRAFFIC CONTROL TOWER CABS

1. SCOPE AND CLASSIFICATION

1.1 Scope.- This specification sets forth the requirements for the manufacture and installation of air traffic control tower cab automatic window washing systems.

1.2 Classification.- Three types of air traffic control tower automatic window washing systems are covered by this specification.

1.2.1 Type.- Air traffic control tower automatic window washing systems to fit the following air traffic control tower cabs are covered by this specification:

Type I	Model C-1 Air Traffic Control Tower Cab
Type II	Model C-2 and C-2A Air Traffic Control Tower Cab
Type III	Model C-1c Air Traffic Control Tower Cab

2. APPLICABLE DRAWINGS, SPECIFICATIONS, AND STANDARDS

2.1 General.- The following documents of the issue in effect on the date of the Invitation for Bids form a part of this specification.

2.2 FAA standard drawings

R-D-0009-1	Drawing list (152 drawings) for Type I, Model C-1 air traffic control tower cab automatic window washer.
R-D-0009-3	Drawing list (152 drawings) for Type II, Model C-2 and C-2A air traffic control tower cab automatic window washer.
R-D-0009-5	Drawing list (155 drawings) for Type III, Model C-1c air traffic control tower cab automatic window washer.
R-D-0009, R-C-0010, R-B-0011, R-A-0012 Drawing Series	Air traffic control tower automatic window washer.

2.3 FAA manuals

FAA Air Traffic Control Tower Cab Automatic Window Washing System Installation Manual, dated 3 April 1972

FAA Air Traffic Control Tower Cab Automatic Window Washing System Operation and Maintenance Manual, dated 3 April 1972.

2.4 FAA standards

FAA-STD-012A	Paint Systems for Equipment
FAA-STD-013	Quality Control Program Requirements

2.5 Federal specifications

TT-E-527	Enamel, Alkyd, Lusterless

2.6 Federal standards

FED-STD-595	Colors

2.7 Military specifications

MIL-P-8585	Primer Coating, Zinc Chromate, Low Moisutre-Sensitivity

2.8 FAA specifications

FAA-C-1217	Electrical Work, Interior
FAA-D-2494/1	Instruction Book Manuscript Technical, Equipments and Systems Requirements, Part I, Preparation of Manuscripts

FAA-D-2494/2 Instruction Book Manuscript Technical Equipment and Systems Requirements, Part II, Preparation of Manuscript Copy Reproducible Art Work.

2.9 Other publications

American Welding Society Welding Handbook, Section 4

National Electrical Code

Underwriters' Laboratories Electrical Appliance and Utilization Equipment List

Underwriters' Laboratories Electrical Construction Materials List

(Copies of the American Welding Society Welding Handbook may be obtained from the American Welding Society, Inc., 2051 Northwest Seventh Street, Miami, Florida 33125.)

(Copies of the National Electrical Code may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110.)

(Copies of Underwriters' Laboratories Lists may be obtained from Underwriters' Laboratories, Inc., Publication Department, 207 East Ohio Street, Chicago, Illinois 60611.)

3. REQUIREMENTS

3.1 General.- The contractor shall provide all necessary services, labor and materials to fabricate and install the equipment for the air traffic control tower cab automatic window washing system. The system shall be fabricated in accordance with the drawing of series: R-D-0009, R-C-0010, R-B-0011, or R-A-0012 and as specified herein. The installation of the system shall be completed in accordance with the FAA Air Traffic Control Tower Cab Automatic Window Washing System Installation Manual.

3.2 Equipment

3.2.1 Window washer system.- The automatic window washing system is made up of five individual window washer units. The window washer units shall be motor driven across the exterior surface of each window with the cleaning action being obtained by a rubber squeegee blade placed in contact with the window glass by air pressure. The components of a complete unit are shown on Drawing No. R-D-0009-M1, sheets 1, 2, and 3.

3.2.2 Track assembly.- Each individual window washer unit shall travel on upper and intermediate track assemblies. The upper track assembly shall be mounted on the parapet of the air traffic control tower cab. The intermediate track assembly is mounted directly above the cab glass windows. The window washer system has five upper and five intermediate track assemblies, one of each for each face of the air traffic control tower cab.

3.2.3 Cleaning solution subsystem.- To aid in the removal of deposits and foreign matter from the exterior surfaces of the cab window glass, a cleaning solution consisting of a water base with wetting agents and detergents, shall be utilized. The cleaning solution subsystem shall consist of a storage reservoir, pump, tubing and nozzles. The control of cleaning solution flow shall be a function of the control system.

3.2.4 Control subsystem.- The control subsystem shall consist of a control panel which contains the components which govern the operation, sequencing, and performance of the automatic window washer subsystem. Connected to the control panel shall be a remote control subpanel (console) through which commands for window washing can be transmitted.

3.2.5 Gutter.- The gutter shall be mounted directly beneath the cab window glass and shall collect the runoff of the cleaning solution. On concrete shaft towers, the leader from the gutter shall tie into the drain from the cab roof within the the junction level.

3.2.6 Heaters.- Mineral insulated heating cable and mineral insulated seamless strip heaters shall be utilized to remove ice from those components of the system which would bind or freeze and prevent proper operation of the system at locations cited in the contract schedule.

3.3 Material, workmanship, and fabrication

3.3.1 Material

3.3.1.1 Shop drawings.- One complete set of reproducibles and four (4) complete sets of prints of the shop drawings shall be submitted to the Contracting Officer for approval prior to the procurement of material or the start of manufacture.

3.3.1.2 Grade.- All equipment, material, and articles incorporated in the work covered by this specification are to be new and of the grade specified on the drawings.

3.3.1.3 Equal material.- Unless otherwise specifically provided in this contract, reference to any equipment, material, article or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality for such equipment, material, article or process. In the event the contractor desires to use any equipment, material, article or process which, in his opinion, is equal to that named, he shall first submit to the Contracting Officer

or his authorized representative for approval, any changes or deviations from the standard drawings. The judgment of the Contracting Officer as to the approval or disapproval of such equal equipment, material, article or process shall be final and conclusive.

3.3.1.4 Subcontracting.- The contractor shall furnish the Contracting Officer for his approval the names of the subcontractors and manufacturers together with the model numbers and other identifying data and information regarding the performance capacity, nature and rating of the machinery, mechanical supplies, and equipment which the subcontractor and manufacturer contemplate using in the work.

3.3.1.5 Approval.- The Contracting Officer will approve, conditionally approve, or disapprove any submission under paragraphs 3.3.1 within 15 working days after receipt. All materials, articles, and finishes incorporated in the work prior to the written approval of the Contracting Officer shall be at the contractor's risk.

3.3.2 Workmanship

3.3.2.1 Performance.- All work under this specification shall be executed by skilled mechanics in a thorough and workmanlike manner. Any part which has defects of any kind, whether in material or workmanship, shall be rejected and such work or part removed and replaced, shall be accomplished at no additional cost to the Government.

3.3.2.2 Superintendence.- The contractor shall have a competent foreman or superintendent on the work at all times.

3.3.2.3 Welding

3.3.2.3.1 Codes and shop drawings.- All welding shall be in accordance with the appropriate recommendations of the American Welding Society's Welding Handbook, Section 4, and shall be done with electrodes or by methods recommended by the manufacturers of the alloys being welded. Type, size, and spacing of welds shall be as shown on the approved shop drawings. All weld spatter and welding oxides on finished surfaces shall be removed by descaling and grinding. Approval of all welds on finished surfaces shall be obtained.

3.3.2.3.2 Finished surfaces.- Unless otherwise indicated, all weld beads on exposed finished surfaces and concealed welds where clearances or fit of other items may necessitate, shall be ground smooth and finished flush and even with adjacent surfaces. Welds on finished surfaces shall be ground and polished smooth to match and blend with finish on the adjacent metal.

3.3.2.4 Dissimilar metal contact surfaces

3.3.2.4.1 Dissimilar metals.- Aluminum surfaces in contact with disimilar metals shall be painted with zinc chromate primer.

3.3.2.4.2 Application.- Apply paint in accordance with section 3.4 of this specification.

3.3.2.5 Electrical standards

3.3.2.5.1 Codes and specifications.- All electrical work in general must conform to requirements of the National Electric Code, latest edition, Underwriters' Laboratories, Inc., Standards, applicable FAA specifications and NEMA standards as specified on the drawings.

3.3.2.5.2 Skill.- Electrical workmanship shall be first class, performed and supervised by skilled technicians with at least two years experience on similar types of work.

3.3.2.5.3 Labeling.- Approval labels and certificates including U. L. approval must be furnished either affixed to respective equipment or submitted in accordance with standard practices.

3.3.3 Fabrication

3.3.3.1 General.- All subassemblies, equipment, parts, supplies, equipment and all other components required for the complete installation of the automatic window washing systems in the field shall be fabricated, assembled, crated and packed ready for shipment by the contractor to the designated installation site.

3.3.3.2 Forming.- Forming shall be true to detail, clean, straight, with sharply defined profiles. Metal shall have smooth, finished surfaces except where otherwise indicated on the drawings.

3.3.3.3 Joints.- All joints shall be of such character and be so assembled so that they will be as strong and rigid as the adjoining sections. Joints required to be welded shall be continuously welded or spot-welded as indicated or approved.

3.3.3.4 Tightness of joints.- Joints exposed to the weather or elements shall be formed to exclude water and be weather-tight, and shall be provided with shop-installed or field-installed joint sealers as called for on the drawings.

3.4 Coating and paint finish

3.4.1 General.- All exposed metal parts including the sheet-metal enclosures, and blade arm assemblies, the upper track and track stands, the intermediate track, the exposed electrical boxes, the gutter system, and any fasteners shall be painted. The paint shall meet Federal Standard 595A and be brown-black in color, conforming to Federal color number 37056.

3.4.2 Cleaning.- All painted surfaces shall be thoroughly cleaned prior to painting. Remove all weld slag and wire-brush or steel-wool welds. Loosen oil, grease, and cutting compounds with naptha or as specified by the paint manufacturer. Cleaning shall be in accordance with FAA-STD-012A.

3.4.3 Primer.- Apply a zinc chromate primer per Specification MIL-P-8585. Color "Y" (yellow) or "G" (green) in two (2) coats to a minimum dry film thickness of 2 mils.

3.4.4 Finish.- Apply an alkyd lusterless enamel per Specification TT-E-527b to a minimum dry film thickness of 1 mil.

3.4.5 Application.- All coats of finishes shall be applied in accordance with FAA-STD-012A and procedures of the manufacturer of the paint.

3.4.6 Field touch-up.- The contractor shall touch-up all painted surfaces following installation of the washer system such that no visible scratches or unpainted surfaces appear except those due to the track rollers or drive gear removing paint from the operating surfaces of the tracks.

3.5 Installation

3.5.1 General.- The contractor shall provide the labor, equipment, and supervision necessary to install the automatic window washing system as outlined in the FAA Air Traffic Control Tower Cab Automatic Window Washing System Installation Manual. The systems are to be installed at operating air traffic tower facilities. The contractor shall submit to the Contracting Officer for approval, a plan detailing the installation of the system. In developing this plan, the contractor shall keep in mind that air traffic safety on the airport depends upon the air traffic controllers in the cab being able to see the airport activity and the surrounding airspace. The contractor shall minimize obstructions to visibility during installation.

3.5.2 Field assembly.- All cutting, punching, reinforcing, drilling, tapping, and fitting required for the assembling, attachment or connection of the various subassemblies and components to the cab shall be executed by skilled mechanics in a thorough and workmanlike manner using templates, gages, or other methods as specified in the drawings and the Federal Aviation Administration Air Traffic Control Tower Cab Automatic Window Washing System Installation Manual.

3.5.3 Field connections.- For field connections only bolts, machine screws and self-tapping screws of 300 series stainless steel shall be used.

3.5.4 Supporting members.- The contractor shall furnish and shall install all supporting members, inserts, fastenings, connections, framing, splice plates, bracing, stiffeners, brackets, straps, bolts,

angles, aligning devices, struts, etc., as required for the proper connection and attachment of the various subassemblies and parts to the tower and cab structure.

3.5.5 Condensation.- The contractor shall make provisions and incorporate them into the fabrication requirements of the system for the removal of condensation, moisture, and water accumulation within the various subassemblies by means of weep holes or other approved means.

3.6 Joint sealants.- All joints between the cab and the window washing system including the tapped holes for the track and gutter shall be sealed as discussed in the installation manual. The joint sealant shall be Dow Corning 780 Building Sealant, or equal. The color of the sealant material shall be brown-black or dull black.

3.7 FAA ATCT Cab Automatic Window Washing System Instruction Book.- The contractor shall furnish an approved manuscript copy of an instruction book for the automatic window washer system in conformance with FAA Specification FAA-D-2494/1 and /2, Instruction Book Manuscript Technical, Equipment and Systems Requirements, Part I, Preparation of Manuscript; and Part II, Preparation of Manuscript Copy Reproducible Art Work. The Operations and Maintenance Manual which is listed under paragraph 2.3 is provided to the contractor for information purposes only. This document is a product of the prototype development contract for the window washer system. It is not intended to alter or replace the requirement for the Instruction Book as set forth in FAA Specification FAA-D-2494/1 and /2.

4. QUALITY ASSURANCE PROVISIONS

4.1 General inspection provisions.- The contractor shall provide and maintain a quality control program which fulfills the requirements of FAA-STD-013, Quality Control Program Requirements. Unless otherwise spacified in the contract, all tests and inspection to determine compliance with the electrical and mechanical requirements of the contract specifications shall be made by the contractor and shall be subject to Government inspection. The term "Government inspection" as used in this specification means that an FAA representative will witness the contractor's testing and inspection, and will carry out such visual and other inspection as deemed necessary to assure compliance with contract requirements. The Government reserves the right to waive Government inspection at the contractor's plant. If Government inspection is waived, the contractor shall furnish certified inspection records describing the readings or results obtained during the inspection and tests required for the applicable contract specifications. The data must demonstrate that the equipment meets contract requirements, including the statement "This certifies that this unit fully meets

all technical requirements of the contract", and be dated and signed by a responsible official of the contractor. Shipment shall not be made until the contractor has received written Government approval of the equipment inspected, or of the certified inspection records.

4.2 Notification of readiness for inspection.- When the contractor has one or more production equipments completed, i.e., equipments produced to meet all contract requirements, he shall notify the Government Contracting Officer not less than five work days before the contractor desires inspection to start.

4.3 Furnishing of test equipment.- The contractor shall supply all the jigs, test fixtures, gauges, and other test and measuring equipment necessary to carry out the test and inspections required under this specification.

4.4 Dimensions.- All dimensions shall be inspected for compliance with contract drawings.

4.5 Finish.- The finish shall be inspected for compliance with 3.4 and subparagraphs thereunder. The coating shall have an even and pleasing appearance. Evidence of rust or primer coat showing through the finish shall be cause for rejection.

4.6 Acceptance testing of operational system after installation.- Each system shall be tested in accordance with the following test procedures to assure the system has been installed properly and is operating satisfactorily. The system shall be field adjusted until all requirements are met.

4.6.1 Mechanical acceptance tests

A. Cycling tests

1. Each unit shall individually perform three complete wash cycles without error using the single window mode of operation.

2. All windows shall be washed three times in sequence without error using the automatic mode of operation.

3. Each machine shall perform a complete wash sequence with simulated wind gusts of 30 mph (20 pounds force applied intermittently at the center of area laterally to the wiper blade).

B. Safety tests

1. The end limit switches of each unit shall be tested by actuating each one while the unit is in operation.

2. The center position safety switch shall be tested by contacting the limit switch on the arm while the machine is in operation with the wiper blade against the window.

3. The control panel interlocks shall be tested by assuring that when one manual selector button is actuated and the selected unit is in operation, pushing any other button shall not affect the operation of the system.

4. The stop button shall be tested to insure that it will completely stop operation at any point in a washing cycle.

5. Using a rain test similar to that described in Underwriters' Laboratories, Inc., Standard for Safety, UL 465, the resistance between current carrying parts and noncurrent carrying parts of the machine and its supporting structure must be not less than 50,000 ohms.

6. The a-c potential between parts of the machine including its electrical enclosures and any other exposed part of the machine on any part within the immediate vicinity of the machine including its supporting structure shall not exceed 5 volts when measured with a meter having a characteristic of 5000 ohms per volt.

4.6.2 Cleaning acceptance tests

A. The window washing system shall leave excess moisture on the windows no more than 1/2 inch from the edges with the exception of the upper outside corner of each unit where 1 inch shall be allowed.

B. The window washing system shall remove in one pass 50 percent of the following residues and effectively all of the following residues in 3 to 5 passes.

1. A salt deposit applied by spraying 5-10 square feet of the windows on each of the five sides with a saturated salt water solution containing sodium chloride salt, and water and allowing the solution to dry completely.

2. A dirt deposit applied by daubing 5-10 square feet of the windows on each of the five sides with a damp rag saturated with dirt locally collected and allowing the deposit to dry completely.

C. The window washing system shall leave no excess moisture on the window other than that allowed in test 4.6.2-A above when forces simulating 30 mph wind gusts are applied to the machine during its operation.

5. PREPARATION FOR DELIVERY

5.1 General.- The contractor shall be responsible for delivering a completely installed system ready for operation by FAA personnel. As such he shall be responsible for completing his own packaging and shipping arrangements to the designated site of installation. FAA is not liable for any losses or damage to the system prior to final acceptance of the installed system by the contracting officer.

6. NOTES

6.1 Note to requisitioning officer

6.1.1 Heating system.- The Invitation for Bid (IFB) shall specify locations that require the heating system to be furnished and installed.

6.1.2 Geographical locations for heater installation.- As a general guide, those areas having on the average one inch or more of snowfall annually, shall be considered for heater installation.

6.1.3 Drawings.- The following drawings will be furnished to the successful bidder for his information for the type of cab upon which the automatic window washer system is to be installed.

Drawing Series AP57 - Canadair Drawings for C-1, C-2, and C-2A

Drawing Series AX959 - Drawings for Model C-1c Cab

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